Consolidated Water Use Efficiency 2002 PSP
Proposal Part One:
A. Project Information Form

1. Applying for (select one):
   - ☒ (a) Prop 13 Urban Water Conservation Capital Outlay Grant
   - ☐ (b) Prop 13 Agricultural Water Conservation Capital Outlay Feasibility Study Grant
   - ☐ (c) DWR Water Use Efficiency Project

2. Principal applicant (Organization or affiliation): City of Lodi
   Public Works Department

3. Project Title: City of Lodi Commercial Water Meter Restoration

4. Person authorized to sign and submit proposal:

Name, title	H. Dixon Flynn, City Manager
Mailing address	221 West Pine Street Lodi, CA 95241
Telephone	209.333.6700
Fax.	
E-mail	dflynn@lodi.gov

5. Contact person (if different):

Name, title.	Richard C. Prima
Mailing address.	221 West Pine Street Lodi, CA 95241
Telephone	209.333.6759
Fax.	
E-mail	rprima@lodi.gov

6. Funds requested (dollar amount): $240,000.00

7. Applicant funds pledged (dollar amount): $25,000.00

8. Total project costs (dollar amount): **$265,000.00**

9. Estimated total quantifiable project benefits (dollar amount): **$313,000.00**
   Percentage of benefit to be accrued by applicant: **70%**
   Percentage of benefit to be accrued by CALFED or others: **30%**

Consolidated Water Use Efficiency 2002 PSP
Proposal Part One:
A. Project Information Form (continued)

10. Estimated annual amount of water to be saved (acre-feet): **33 Acre-feet**

    Estimated total amount of water to be saved (acre-feet): **122 Acre-feet**

    Over ___ years **20**

    Estimated benefits to be realized in terms of water quality, instream flow, other: **Use of less ground water, less wastewater discharge to SJ Delta.**

11. Duration of project (month/year to month/year): July 2002 - July 2004

12. State Assembly District where the project is to be conducted: 10th Assembly District

13. State Senate District where the project is to be conducted: 5th State Senate District

14. Congressional district(s) where the project is to be conducted: 11th Congressional District

15. County where the project is to be conducted: San Joaquin County

16. Date most recent Urban Water Management Plan submitted to the Department of Water Resources: October 2001

17. Type of applicant (select one):
    Prop 13 Urban Grants and Prop 13 Agricultural Feasibility Study Grants:
    - ☒ (a) city
    - ☐ (b) county
    - ☐ (c) city and county
    - ☐ (d) joint power authority
    - ☐ (e) other political subdivision of the State, including public water district
    - ☐ (f) incorporated mutual water company

    DWR WUE Projects: the above entities (a) through (f) or:
    - ☐ (g) investor-owned utility
    - ☐ (h) non-profit organization
    - ☐ (i) tribe
    - ☐ (j) university
    - ☐ (k) state agency
    - ☐ (l) federal agency

18. Project focus:
    - ☐ (a) agricultural

☒ (b) urban

Consolidated Water Use Efficiency 2002 PSP
Proposal Part One:
A. Project Information Form (continued)

19. Project type (select one):
Prop 13 Urban Grant or Prop 13 Agricultural Feasibility Study Grant capital outlay project related to:

☒ (a) implementation of Urban Best Management Practices

☐ (b) implementation of Agricultural Efficient Water Management Practices

☐ (c) implementation of Quantifiable Objectives (include QO number(s)

.....

☐ (d) other (specify)

.....

DWR WUE Project related to:

☐ (e) implementation of Urban Best Management Practices
☐ (f) implementation of Agricultural Efficient Water Management Practices
☐ (g) implementation of Quantifiable Objectives (include QO number(s))
☐ (h) innovative projects (initial investigation of new technologies, methodologies, approaches, or institutional frameworks)
☐ (i) research or pilot projects
☐ (j) education or public information programs
☐ (k) other (specify)

.....

20. Do the actions in this proposal involve physical changes in land use, or potential future changes in land use?

☐ (a) yes

☒ (b) no

If yes, the applicant must complete the CALFED PSP Land Use Checklist found at http://calfed.water.ca.gov/environmental_docs.html and submit it with the proposal.

Consolidated Water Use Efficiency 2002 PSP
Proposal Part One
B. Signature Page

By signing below, the official declares the following:

The truthfulness of all representations in the proposal;

The individual signing the form is authorized to submit the proposal on behalf of the applicar and

The individual signing the form read and understood the conflict of interest and confidentialit section and waives any and all rights to privacy and confidentiality of the proposal on behalf of the applicant.

_____	H. Dixon Flynn, City Manager	February 28, 2002
Signature	Name and title	Date

City of Lodi

Consolidated Water Use Efficiency 2002 PSP

Proposition 13 Urban Grant Proposal – Part Two

Project Summary

The City of Lodi is located in the Northern San Joaquin Valley. Lodi has a population of approximately 59,000. The domestic water supply is 100% groundwater served by 25 wells located throughout the City. The groundwater levels have been declining under Lodi and groundwater level depletion is a problem throughout the basin. To further describe The City of Lodi and the water system, portions of the City of Lodi's *Urban Water Management Plan* dated October 2001 are attached as Appendix A.

While Lodi has a successful Water Conservation program, not all of the commercial customers are metered. While there are approximately 1,000 metered commercial/industrial water customers, there are approximately 250 unmetered commercial service connections that are still charged by a flat rate. Due to fiscal reasons, a program to retrofit the remaining unmetered customers with meters was discontinued.

The water conserving effects of metering a water service has been well established. It has been estimated by previous studies that water use reductions of approximately 20% are realized by metering water customers. The reductions occur due to customer awareness of the amount of water that is being used, leak detection capabilities a water meter affords and the ability of the water utility to track water use.

By approving the submittal for this grant, the City Council has agreed in principal to meter the remainder of commercial water users if funds were made available.

The City of Lodi has contemplated the linking of metered water usage to sewer rates, but a major stumbling block has been the lack of water meters on all commercial services. Once meters are installed on all commercial water services and if the change in billing were to take place, there would be a reduction in the amount or water usage due to the double monetary effect of water usage. This is hard to quantify, however a conservative 2% estimate has been projected.

Due to the staffing situation and current workload, much of the meter installation work may be performed by outside contractors and/or contracted employees. While some of the services will simply require the placement of a meter in the existing meter box, many of the water services will require relocating in order to accommodate metering.

A. Scope of Work: Relevance and Importance

1. There are approximately 250 unmetered water services in the City of Lodi. All remaining unmetered water services will be retrofitted with a metered water service. These flat rate services will be evaluated for the amount of work needed to retrofit with meters. The installation of water meters has been shown to reduce the amount of water

usage by those customers. It is believed that the same effect will occur with these customers thereby reducing the amount of groundwater used.

2. The local and regional decline in the groundwater basin has been well documented. Local groundwater issues are discussed in the attached portions of the City of Lodi's *Urban Water Management Plan*. Also, portions of the executive summary of the *San Joaquin County Water Management Plan – Analysis and Strategy* are attached as Appendix B.

B. Scope of Work: Technical/Scientific Merit, Feasibility, Monitoring and Assessment

1. The installation of water meters is a standard practice and required on all new water customers in California. New commercial water services and existing unmetered water services which have taken out a building permit which involves significant expenditures (above $31,500) are required to be retrofitted with a metered water service at the owner's expense. Therefore the technology for installing meters is used on an ongoing basis in Lodi and throughout the industry. Copies of the City of Lodi Standard Plans for (Metered) Water Services are attached in Appendix C.
2. The work schedule is projected to be as follows following the signing of the grant.

   a) Months 1 – 3: Specifications for bidding the job, qualifications for qualified contractors and tasks to be bid will be prepared. Cost: $3,000 (City Staff)

   b) Month 4: Qualified contractors to perform the water meter installations will be solicited and asked to bid the job. Cost: $1,500 (City Staff)

   c) Month 5: Qualified contractor's bids will be evaluated and interviewed. Cost: $1,500 (City Staff)

   d) Month 6: Contractor(s) awarded contract(s) will be notified, contracts signed and contractor(s) will be given a notice to proceed. Cost: $1,000 (City Staff)

   e) Month 7: Evaluation of the plan to proceed with the contractor(s), ordering of materials (water meters, meter boxes, valves, etc.), and commencement of work on the easiest meter installations (unmetered services with existing meter boxes). Notification of effected water customers. Cost: $3,000 (City Staff)

   f) Months 8 – 11: Completion of installation of the unmetered services with existing meter boxes and start of evaluation and installation of meters of unmetered services without existing meter boxes. Cost: $40,000 (Grant)

   g) Months 12 – 24: Completion of all unmetered water services retrofitted with metered services. Cost: $200,000 (Grant)

   h) Months 18 – 36: Monitoring, assessment and evaluation of the water production records to quantify water use reductions. Cost: $5,000 (City Staff)

   i) Entire Project: Administration and Quarterly Reports. Cost $10,000 (City Staff)

   A task time schedule is attached in Appendix D.

3. Monitoring and assessment of water reductions from individual water customers that are retrofitted will be difficult because of current water use being unknown due to a lack of a water meter. The water production within Lodi is well documented however. The impact of reduced water consumption by these customers will be evaluated using both total water production and the trends of usage by the newly metered customers as they are able to review their water usage and detect leaks within their water systems. The water meters are read monthly and the usage is recorded. It is expected that an overall water use reduction of 20% will be realized at the newly metered customers.

C. Qualifications of the Applicants and Cooperators.

1. Project Manger: Richard C. Prima Jr. P.E., Resume attached in Appendix E.
2. External cooperators – unknown at this time.

D. Benefits and Costs.

1. Budget Breakdown and Justification

   a) Land Purchase/Easement - NA

   b) Planning/Design/Engineering – $8,000, see the attached cost breakdown. The work is needed to properly direct the project. Much of the engineering and design has already been performed in Lodi's Standard Plans for metered water services. Planning for the project and additional engineering services where water mains may have to be upgraded and/or relocated may be needed.

   c) Materials/Installation – $240,000. Cost is based on number of services at various sizes and the calculated cost of installation. See the City of Lodi Fee and Service Charge Schedule for metered water service installations calculated from records of actual time and material costs in Appendix F. See the breakdown for estimated project installation costs in Appendix G.

   d) Structures - NA

   e) Equipment Purchases/Rentals – NA

   f) Environmental Mitigation/Enhancement - NA

   g) Construction/Administration/Overhead – $17,000, see attached cost breakdown. The staff time required to administer the grant and the work of a construction firm will be considerable and will be bore by the City of Lodi.

   h) Project/Legal/License - NA

   i) Contingency (up to 15%, amount must be fully justified by applicant) –

   j) Other – NA

2. Cost Sharing.

The City of Lodi will contribute the planning, design, engineering, administration and overhead required to complete the project. This will be accomplished mainly by dedicating time from existing staff. This estimated contribution will total approximately $25,000 as shown in Appendix H.

3. Benefit Summary and Breakdown.

The savings in water are estimated to be 9.1 million gallons of groundwater annually directly from the installation of meters at the effected customers and the benefits would continue to be realized (Appendix I). Also, with the installation of meters on all commercial water services, it is a goal to convert the flat rate sewer billings to a sewer rate tied to the metered water. It is estimated that this will also reduce the overall water use, in order to save on sewer bills, by 2% of all commercial customers. This will eventually save an additional 17,000,000 gallons per year by the year 2004. Water savings in addition to the above due to water awareness brought about by publicity of the project was not estimated.

4. Assessment of Costs and Benefits.

The total cost of the project is estimated (including the City of Lodi's contributions) at $265,000. Over 20 years the estimated total discounted benefits are $313,000. The benefit cost ratio is calculated at 1.3 in the Benefit/Cost Ratio spreadsheet in Appendix J.

The City of Lodi's Urban Water Management Plan, dated October 2001, completed by Brown and Caldwell Consulting Engineers in conjunction with City staff, identified metering residential water services as a viable best management practice (BMP), however, current public opinion and City Council direction has not favored that approach. That BMP has been modified to retrofit only existing unmetered commercial water services.

It is assumed that metering water services and charging a commodity rate reduces water consumption by 20%. It is assumed that by changing the basis for sewer billing for all industrial/commercial customers to a percentage of their metered water, this will reduce water use by an additional 2%. It is assumed that the above water savings will also effect the amount of wastewater discharged and thereby reduce a percentage of the capital costs associated with the next wastewater treatment plane upgrade/expansion. It is assumed that the cost of installing the water meters for this project will be similar to the current documented costs. See above discussions, spreadsheets and attachments for details of the assumptions.

Quantifying the beneficiaries is a difficult task. The benefit/cost ratio spreadsheet quantifies the benefits into dollars. The benefits of less depletion of the groundwater basin, reduced flows from the wastewater treatment plant to the San Joaquin Delta, slowing of saline intrusion into the groundwater basin are less quantifiable in the scope of this proposal. Most of the direct benefits will be realized by the City of Lodi in groundwater savings and less wastewater treatment/discharge costs. There are regional benefits to the groundwater table outside of the City of Lodi limits and to the San Joaquin Delta in less wastewater discharges. It is estimated that 70% of the

benefit will be realized by the City of Lodi directly and 30% benefit realized by the CalFed objectives of regional water environment enhancement.

The benefit/cost ratio spreadsheet quantifies the benefits into dollars. The benefits of less depletion of the groundwater basin, reduced flows from the wastewater treatment plant to the San Joaquin Delta, slowing of saline intrusion into the groundwater basin are not quantified in the analysis of this proposal.

The benefit/cost ratio spreadsheet shows that, with the assumptions used, the project is locally cost effective with the benefit/cost ratio calculated at 1.3.

E. Outreach, Community Involvement and Acceptance

Approximately 250 water services serving an estimated 290 flat rate customers, including their employees, will be intimately involved with this project by receiving a metered water service for the first time at their current address. Letters will go out to these water customers explaining the project and how it will effect their water billing in the future. The customers will also be advised about possible water leaks they may not be aware of which may use relatively large amounts of water.

Commercial water meters have been accepted in Lodi for years. Individual customer acceptance is expected to vary. The fact that all commercial water customers will now be equally metered will have a positive effect.

Local newspapers will carry stories related to the project and the goals of the project. Local citizens will see a direct benefit of the Proposition 13 grant program.

The work caused by this project will directly benefit both local contractors and the persons hired by them to perform the work, as well as the manufacturers of water meters, meter boxes, valves and other needed hardware.

APPENDIX A

Urban Water Management Plan

APPENDIX B

San Joaquin County Water Management Plan
Analysis and Strategy

APPENDIX C

Lodi Standard Plans for (Metered) Water Services

APPENDIX D

Tasks and Time Schedule

APPENDIX E

Resume: Richard C. Prima Jr. P.E.

APPENDIX F

Fee Service and Charge Schedule
(For Water Meter Installations)

APPENDIX G

Contractor Installation Cost Estimates

APPENDIX H

City of Lodi Staff Cost Contribution

APPENDIX I

Water Savings Calculation
From Direct Water Meter Usage Reduction

APPENDIX J

Benefit/Cost Ratio Spreadsheet

APPENDIX H

City of Lodi Staff Cost Contribution

APPENDIX I

Water Savings Calculation
From Direct Water Meter Usage Reduction

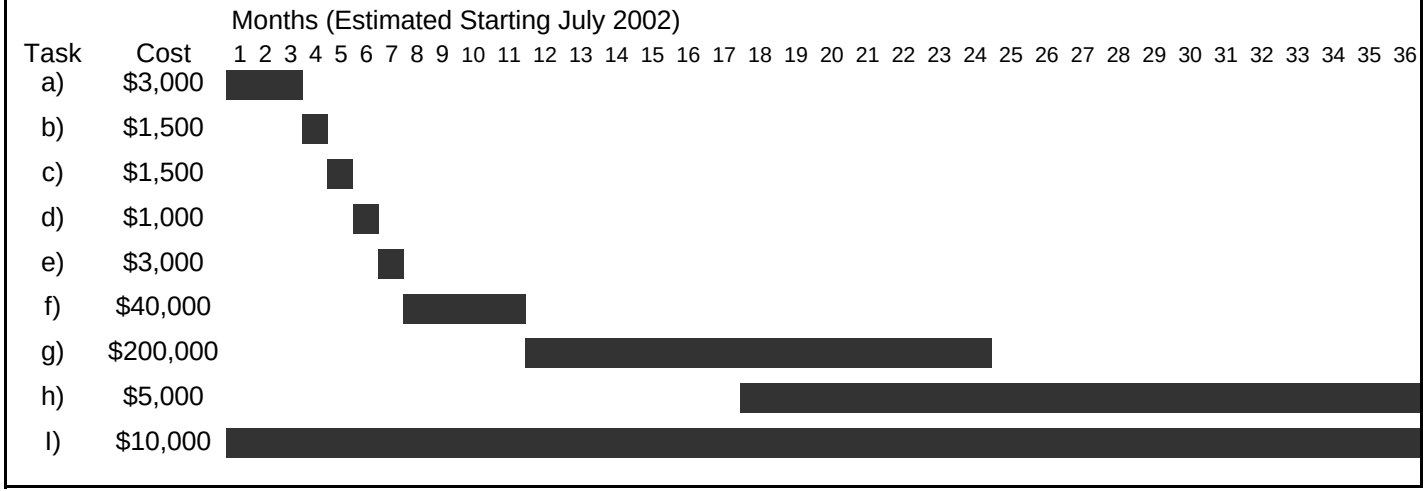
APPENDIX J

Benefit/Cost Ratio Spreadsheet

City of Lodi

Proposition 13 Urban Grant

Tasks Costs, and Time Schedule



a) Months 1 – 3: Specifications, qualifications, and tasks to be bid will be prepared. Cost: $3,000
b) Month 4: Qualified contractors to perform the water meter installations will be solicited. Cost: $1,500
c) Month 5: Qualified contractors bids will be evaluated and contractors interviewed. Cost: $1,500
d) Month 6: Contractor(s) awarded contract(s), contracts signed and give notice to proceed. Cost: $1,000
e) Month 7: Evaluation of the plan, order materials, and start installations. Customer notification. Cost: $3,000
f) Months 8 – 11: Complete services w/ meter boxes and start installation on other services. Cost: $40,000
g) Months 12 – 24: Completion of all unmetered water services retrofitted with metered services. Cost: $200,000
h) Months 18 – 36: Monitoring, assessment and evaluation to quantify water use reductions. Cost: $5,000
i) Entire project: Administration and Quarterly reports, Cost: $10,000

City of Lodi
Public Works Department

Fee and Service Charge Schedule

Water

Add applicable Development Impact Mitigation Fees - See Page 5

Service Installation

Reference: LMC §13.04.050

Service Only w/o meter - 1"	$ 875.00
1½"	$ 1,250.00
2"	$ 1,400.00
3" & over	per T&M estimate
Upgrade of existing service w/line replacement	
In street or alley w/o meter	80% of above
In easement w/o meter	66 2/3% of above
Upgrade of existing service w/o line replacement	
In street or alley w/o meter	66 2/3% of above
In easement w/o meter	50% of above
Complete Service with meter - 1"	$ 1,050.00
1½"	$ 1,610.00
2"	$ 1,900.00
3" & over	per T&M estimate
Meter install only - ¾"	$195.00*
1"	$ 230.00
1½"	$ 425.00
2"	$ 570.00
3" & over	per estimate
"TouchRead" install only	$120.00*
Disconnect/Abandon service:	
2" & under	$ 250.00
over 2"	per T&M estimate

For service installed with downsized meter, charge will be adjusted.
(Example: 2" service w/1½" meter: $1,400 + $425 - $55 = $1,770)

*Cost includes $55 to set meter/"TouchRead".

Credit may be allowed for meter removed if less than 10 years old.

Typical Circumstances and Costs in Street or Alley

New 1" service with ¾" meter	$ 1,015.00
Upgrade 1" service line & box with ¾" meter	$ 840.00
Upgrade 1" box with ¾" meter	$ 725.00
Install ¾" meter in existing suitable service	$ 195.00

Service Charges

Reference: Resolution No. 2001-231

Residential Flat Rate (per month):		
Single Family Unit (one bedroom)	$ 10.81	
(two bedrooms)	$ 12.98	
(three bedrooms)	$ 15.56	
(four bedrooms)	$ 18.69	
(five bedrooms)	$ 22.43	
(six bedrooms)	$ 26.91	
(seven bedrooms)	$ 32.28	
Multiple Family Unit (one bedroom)	$ 9.28	
(two bedrooms)	$ 11.13	
(three bedrooms)	$ 13.35	+ 20% for ea. add'l. bedroom
Commercial/Industrial Flat Rate	Existing accounts only. New accounts are metered.	
Bacterial Sampling Fee	$ 45.00	per sample
Metered Rate	$ 0.397	per 100 cu. ft. (approx. 53¢ per 1,000 gal.)
plus monthly base charge:	$ 11.43	¾" meter
	$ 17.14	1" meter
	$ 22.85	1½" meter
	$ 28.58	2" meter
	$ 40.00	3" meter
	$ 51.43	4" meter
	$ 74.29	6" meter
	$ 97.16	8" meter
Construction Water Charges:		Ref. PWD Policy W-7
Water	$ 0.397	per 100 cu. ft. (approx. 53¢ per 1,000 gal.)
6" Meter Deposit	$ 5,000.00	
Meter Rental (per day)	$ 1.00	first 45 days
	$ 2.50	during days 46 through 60
	$ 5.00	during days 61 through 90
	$ 10.00	days over 90

day count begins when meter is picked up at MSC
day count ends when meter is returned to MSC

City of Lodi

Proposition 13 Urban Grant Proposal

Contractor Installation Cost Estimates:

Service/ Meter Size	No. of current flat rate services	Adjusted meter/ service sizes	Install Meter Only	Approx. Cost	Extended Cost	Upgrade to meter service	Approx. Cost	Extended Cost	New line & abandon old	Approx. Cost	Extended Cost	
0.75	191	131	33	$ 195	$ 6,435	66	$ 894	$ 59,004	33	$ 1,265	$ 41,745	
1.00	12	62	16	$ 230	$ 3,680	31	$ 923	$ 28,613	16	$ 1,300	$ 20,800	
1.50	20	25	6	$ 425	$ 2,550	13	$ 1,488	$ 19,344	6	$ 1,860	$ 11,160	
2.00	2	7	2	$ 570	$ 1,140	4	$ 1,824	$ 7,296	2	$ 2,150	$ 4,300	
2.00	5	5	1	$ 570	$ 570	3	$ 1,824	$ 5,472	1	$ 2,150	$ 2,150	
Misc. small	6	6	2	$ 230	$ 460	3	$ 1,050	$ 3,150	2	$ 1,300	$ 2,600	
Misc. Lrg	7	7	2	$ 570	$ 1,140	4	$ 1,824	$ 7,296	2	$ 2,150	$ 4,300	
4.00	1	1	0	$ 1,700	$ 0	1	$ 3,300	$ 3,300	0	$ 4,250	$ 0	
6.00	1	1	0	$ 2,000	$ 0	1	$ 4,000	$ 4,000	0	$ 5,000	$ 0	
	245	245	62		$ 15,975	126		$ 137,475	62		$ 87,055	$ 240,505
										City contribution:		$ 25,000
												$ 265,505
										Cost per Meter Installation		$ 1,084

City of Lodi

Proposition 13 Urban Grant Proposal
City of Lodi Staff Cost Contribution

Task	Hours	Hourly City Cost* $ 50.00
Write project specifications, prepare bid packet, get City Council Approval	60	$ 3,000
Research qualified contractors, advertise, print and distribute bid packet	30	$ 1,500
Evaluate bids, interview qualified contractors select contractor(s)	30	$ 1,500
Offer project work to selected contractor(s), sign contracts, give notice to proceed	20	$ 1,000
Evaluate plan to proceed with project, notify affected costomers, oversee contractors work	60	$ 3,000
Monitoring and assessment	100	$ 5,000
Administration, quarterly reports	200	$ 10,000
	Total City Work Contribution	$ 25,000

Planning/Design/Engineering	$ 8,000
Construction/Administration/Overhead	$ 17,000
Total City Work Contribution	$ 25,000

* Average $ per hour with overhead: PWD/Asst WW Supt/ Analyst I

City of Lodi

Proposition 13 Urban Grant Proposal

Water Savings Calculation
From Direct Water Meter Usage Reduction

		Gallons per year				
Size Meter (inches)	No. of Services	Estimated Average water use in Lodi	Estimated Total water use in Lodi	Estimated Savings of 20% per connection *	Total Annual Groundwater Savings	Acre Feet per Year Savings
0.75	131	125,000	16,375,000	25,000	3,275,000	10.1
1.00	68	200,000	13,600,000	40,000	2,720,000	8.3
1.50	32	300,000	9,600,000	60,000	1,920,000	5.9
2.00	12	400,000	4,800,000	80,000	960,000	2.9
4.00	1	500,000	500,000	100,000	100,000	0.3
6.00	1	600,000	600,000	120,000	120,000	0.4
Totals	245	2,125,000	45,475,000		9,095,000	27.9

* Estimated Savings include conservation due to meter and leak detection capabilities from UWMP.

Gallons per day per meter: 509

City of Lodi

Proposition 13 Urban Grant Proposal

B/C Ratio

						Benefits ($)					Costs ($)					
Calendar Year	Percent of Meters Installed	Accounts Retrofitted With Meters	Incremental Water Savings (AF/yr)	Annual Metered Water Savings (AF/yr)	Annual WW Rate effect Savings (AF/yr)	Avoided Capital Costs	Avoided Variable Costs	Avoided Purchase Costs	Total Un-discounted Benefits	Total Discounted Benefits	Capital Costs	Financial Incentives	Operating Expenses	Total Undiscounted Costs	Total Discounted Costs	Net Present Value ($)
2002	20%	49	6	6	0	0	3,000	0	3,000	2,830	48,118	0	0	48,118	45,394	-42,564
2003	80%	196	22	28	0	0	14,000	0	14,000	12,460	192,472	0	0	192,472	171,299	-158,839
2004				28	5	12,240	16,500	0	28,740	24,131	0	0	0	0	0	24,131
2005				28	5	12,240	16,500	0	28,740	22,765	0	0	0	0	0	22,765
2006				28	5	12,240	16,500	0	28,740	21,476	0	0	0	0	0	21,476
2007				28	5	12,240	16,500	0	28,740	20,261	0	0	0	0	0	20,261
2008				28	5	12,240	16,500	0	28,740	19,114	0	0	0	0	0	19,114
2009				28	6	12,240	17,000	0	29,240	18,346	0	0	0	0	0	18,346
2010				28	6	12,240	17,000	0	29,240	17,307	0	0	0	0	0	17,307
2011				28	6	12,240	17,000	0	29,240	16,327	0	0	0	0	0	16,327
2012				28	6	12,240	17,000	0	29,240	15,403	0	0	0	0	0	15,403
2013				28	6	12,240	17,000	0	29,240	14,531	0	0	0	0	0	14,531
2014				28	6	12,240	17,000	0	29,240	13,709	0	0	0	0	0	13,709
2015				28	6	12,240	17,000	0	29,240	12,933	0	0	0	0	0	12,933
2016				28	6	12,240	17,000	0	29,240	12,201	0	0	0	0	0	12,201
2017				28	7	12,240	17,500	0	29,740	11,707	0	0	0	0	0	11,707
2018				28	7	12,240	17,500	0	29,740	11,044	0	0	0	0	0	11,044
2019				28	7	12,240	17,500	0	29,740	10,419	0	0	0	0	0	10,419
2020				28	7	12,240	17,500	0	29,740	9,829	0	0	0	0	0	9,829
2021				28	7	12,240	17,500	0	29,740	9,273	0	0	0	0	0	9,273
2022				28	7	12,240	17,500	0	29,740	8,748	0	0	0	0	0	8,748
2023				28	7	12,240	17,500	0	29,740	8,253	0	0	0	0	0	8,253
Totals:	100%	245	28	594	122	244,800	358,000	0	602,800	313,067	265,580	0	0	265,580	239,201	73,866

Value of conserved water ($/AF) =	500
Discount rate (real) =	6.00%
Connection unit water use demand (gpd/connection) =	509
Water savings =	20%
Conservation measure unit cost for metering services, no meters ($) =	1084
Cost to read and maintain one meter ($/year) =	18
Number of unmetered accounts pre-1993(no meter boxes, no meters) =	245

Benefit cost ratio:	**1.3**
Simple pay-back period (years):	**17**
Discounted cost / water saved ($/acre-feet):	**334**
NPV / water saved ($/acre-feet):	**103**

CITY OF LODI

URBAN WATER MANAGEMENT PLAN

OCTOBER 2001

City of Lodi
Urban Water Management Plan – October 2001

EXECUTIVE SUMMARY

This Plan is the year 2000 Urban Water Management Plan as required by the Urban Water Management Planning Act and it serves as the long-term water supply plan for the City of Lodi (City). The purpose of this Plan is to ensure the efficient use of available water supplies, describe and evaluate the existing water system and historical and projected water use, and evaluate current and projected water supply reliability as required by the Urban Water Management Act (Act).

Description of Existing Water System

The City of Lodi Water Utility is the only water purveyor in the City and serves approximately 16,753 connections. Lodi is located in the northern San Joaquin Valley bordered to the north by the Mokelumne River. Groundwater from 24 active wells with a combined capacity of 33,695 gallons per minute (gpm) is the sole source of water supply for the City of Lodi. The City's distribution system consists of one pressure zone, two storage facilities, a pumping station, and the piping system.

Historical and Projected Water Use

The year 2000 population in Lodi is 57,935 people and is expected to reach 78,030 in 2020. Water demands through the year 2020 are estimated based on a 1.5 percent annual water demand growth rate estimated by the City of Lodi's Public Works Department. Table ES-1 presents the projected water demands through year 2020.

Table ES-1. Total Projected Water Demands

	Annual average		Maximum day
Year	ac-ft/yr[a]	mgd	mgd
2000	16,874	15.1	29.2
2005	18,178	16.2	31.5
2010	19,583	17.5	33.9
2015	21,096	18.8	36.5
2020	22,727	20.3	39.4

[a] acre-feet/year

Water Supply Quantity

Groundwater is currently the sole source of water for the City. From 1990 through 1999, groundwater use averaged 14,787 ac-ft/yr. The groundwater basin is considered to be over drafted. The City will have to take steps to reduce overall groundwater pumping by itself and/or others. For the purpose of this study, it is estimated that the available sustainable groundwater supply is approximately equal to 1980 pumping, or 12,000 ac-ft/yr. This assumption regarding sustainable groundwater supply is only an approximation since the safe yield of the groundwater basin underlying the City has not been defined. Given this assumption, the City does not have a sustainable water supply for preventing over draft through the year 2020. Given current practices, however, the City will still be able to pump sufficient groundwater during this over drafting period. A water supply reliability comparison is made in Table ES-2 for the year 2020, considering three water supply scenarios: an average/normal water year; single dry water year; and multiple dry water years. As shown in Table ES-2, the water supply would be overdrafting during multiple dry years.

Table ES-2. Water Supply Reliability, 2020, ac-ft/yr

	Average/normal water year	Single dry water year	Multiple dry water years		
			Year 1	Year 2	Year 3
Sustainable water supply					
Surface water	0	0	0	0	0
Groundwater[a]	12,000	12,000	12,000	12,000	12,000
Recycled water	0	0	0	0	0
Total	12,000	12,000	12,000	12,000	12,000
2020 Demand	22,727	**22,727**	**22,727**	**22,727**	**22,727**
Surplus or (Deficit)	**-10,727**	**-10,727**	**-10,727**	**-10,727**	**-10,727**

Units of measure: ac-ft/yr

[a] Based on 1980 pumping rate.

Water Conservation Best Management Practices

The results of an economic analysis conducted on several of the water conservation Best Management Practices (BMPs) shows that all analyzed BMPs are not economical to implement except for BMP 5 (Large Landscapes Conservation Programs and Incentives), and BMP 4 (Metering of Residential Customers).

Recycled Water

At this time, the use of recycled water is not a viable option at this time to reduce the total water demand in the City's water service area because it is a significant distance from the source of recycled water at the White Slough Water Pollution Control Facility. The estimated $7.8 million cost of installing pumping facilities and a pipeline to convey recycled water to the service area from the wastewater treatment plant is considered to be expensive at this time compared to the cost of available groundwater. The recycled water use of approximately 4,500 acre-feet per year surrounding the treatment plant, however, does decrease the amount of regional groundwater pumping in the area and can be considered a form of indirect recycling. The City intends to pursue the use of recycled water if it becomes a more economically feasible option.

Recommendations

1. Because the City's groundwater supply is not sustainable to prevent overdraft over the long term, the City should continue participation in the Northeastern San Joaquin County Groundwater Banking Authority towards the development of a conjunctive use program to reduce the overall pumping of groundwater in the area.

2. It does not appear economically feasible at this time to partially meet water demands in the City's water service area through use of recycled water. The estimated $7.8 million cost of installing pumping facilities and a pipeline to convey recycled water to the service area from the wastewater treatment plant is considered to be expensive at this time compared to the cost of available groundwater. The City should reassess this issue in five years and continue to provide treated water for reuse on lands surrounding the White Slough Water Pollution Control Facility to minimize the amount of groundwater pumping in the region.

3. Continue with current water conservation efforts. Consider implementing the cost effective BMP 5 (Large Landscapes Conservation Programs and Incentives), BMP 9 (CII Conservation), BMP 14 (Residential ULFT), and BMP 4 (Metering of Residential Customers). The City should explore partnering with other utilities and funding opportunities to help implement water conservation BMPs.

4. Track the development of upcoming drinking water standards that may impact the groundwater supply. These standards include arsenic, radon, and the groundwater rule.

5. To maintain groundwater supply capacity, the City should rehabilitate or replace any older wells as they reach the end of their useful lives.

6. Establish a process to record BMP implementation and measure the resulting water savings resulting from BMP implementation.

CHAPTER 1

INTRODUCTION

This Urban Water Management Plan (Plan) addresses the City of Lodi (City) Water Utility (Utility), which provides water to approximately 16,753 connections, serving a population of 57,935 people within the City's boundaries. This Plan is the year 2000 Urban Water Management Plan as required by the Urban Water Management Planning Act (California Water Code Division 6, Part 2.6, Sections 10610 through 10640) and it serves as the long-term water supply plan for the City. The remainder of this chapter provides an overview of the Plan, previous reports, conduct of the study, and public participation.

1.1 Urban Water Management Planning Act

The purpose of this Plan is to ensure the efficient use of available water supplies, describe and evaluate the existing water system and historical and projected water use, and evaluate current and projected water supply reliability as required by the Urban Water Management Act (Act). The Act became part of the California Water Code with the passage of Assembly Bill 797 during the 1983–1984 regular session of the California legislature. The Act requires every urban water supplier providing water for municipal purposes to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually to adopt and submit an Plan every 5 years to the California Department of Water Resources (DWR). Subsequent assembly bills have amended the Act. The Urban Water Management Plan checklist is presented in Appendix B. This checklist is requested by DWR and is to facilitate review of this plan.

1.2 Previous Reports

The City's Urban Water Management Plan was first developed in 1990, which addressed water supply and demand for the City of Lodi. The 1990 Plan and 1995 Plan update were prepared by the City. The 1995 update included a description of the water system, historical and projected water use, water supply alternatives, recycled water use, water conservation programs, and a water shortage contingency plan.

1.3 Public Participation

The Act requires the encouragement of public participation and a public hearing regarding the Water Management Plan. This hearing provided an opportunity for Lodi's customers/residents and employees in the area to learn about the water supply situation and the plans for providing a reliable, safe, high-quality water supply for the future. The hearing also allowed people to ask questions regarding the current situation and the viability of future plans. This Plan was finalized after the public hearing.

A public hearing was held at a regular meeting of the Lodi City Council on July 18, 2001. Information regarding the public hearing is included in Appendix G.

Chapter 2

DESCRIPTION OF EXISTING WATER SYSTEM

This chapter describes the City of Lodi Water Utility system (Utility) and includes a description of the service area and climate, the groundwater wells, the reservoirs, and the piping system. The water system's water supply is described in Chapter 4.

2.1 Description of Service Area

The City of Lodi Water Utility is the main water purveyor for the City of Lodi. The City's boundary is the water utility's service area with a few minor connections outside of the City's boundaries. The Utility serves approximately 16,753 connections in the City, which is in the Northern San Joaquin Valley in San Joaquin County and bordered to the north by the Mokelumne River. The Utility service area is essentially the City's boundaries and characterized by a mixture of residential, commercial, and industrial land use. The terrain is essentially flat. Historical and projected population is addressed in detail in Chapter 3.

2.2 Climate

The City of Lodi has cool and humid winters, and hot and dry summers. Lodi's average daily temperature ranges from 37 to 90 degrees Fahrenheit, but the extreme low and high temperatures have been 11 and 111 degrees Fahrenheit, respectively (Western Regional Climate Center, 1999). The historical annual average precipitation is approximately 18 inches. The rainy season begins in November and ends in March. Average monthly precipitation during the winter months is about 3 inches, but records show that the monthly precipitation has been as high as 9.7 inches and as low as 0 inches. Relative humidity in the region ranges from 26 percent to 91 percent. Low humidity usually occurs in the summer months, from May through September. The combination of hot and dry weather during the summer results in high water demands during the summer.

2.3 Water Supply Facilities

Groundwater from 24 wells is the only source of water supply for the City of Lodi. Currently, all wells are active production wells. The locations of the groundwater wells in Lodi are illustrated in Figure 2-1. Well 10R has been permanently abandoned.

2.3.1 Wells. Twenty-four wells with a combined capacity of 33,695 gallons per minute (gpm) provide the City of Lodi's annual water production. The wells operate automatically on water pressure demand and pump directly into the distribution system. The water is periodically chlorinated three to six weeks per year. The current capacity of existing wells is summarized in Table 2-1. Several of the wells have granular activated carbon (GAC) treatment to remove dibromochloropropane (DBCP).

Table 2-1. City of Lodi System Wells

Well number	Well capacity, gpm[b]	Well capacity, mgd[c]
1R	1,250	1.8
2	850	1.2
3R	825	1.2
4R[a]	1,640	2.4
5	1,325	1.9
6R	1,570	2.3
7	1,200	1.7
8	950	1.4
9	1,150	1.7
11R	1,410	2.0

12	810	1.2
13	1,060	1.5
14	1,675	2.4
15	1,625	2.3
16[a]	1,050	1.5
17	2,000	2.9
18[a]	1,750	2.5
19	1,230	1.8
20[a]	1,900	2.7
21	2,160	3.1
22[a]	1,475	2.1
23[a]	1,520	2.2
24	1,570	2.3
25	1,700	2.4
Total well water supply	33,695	48.5

[a] Wells with GAC treatment.
[b] gpm = gallons per minute.
[c] mgd = million gallons per day.

2.4 Distribution System

The City of Lodi's distribution system consists of an elevated storage tank, one storage facility and pumping station, and the piping system. A one million gallon storage tank, located east of Highway 99 on Thurman Street, stores groundwater from nearby wells to meet peak hour demands and fire flows. The 100,000 gallon elevated storage tank is located on North Main Street. The storage facilities and their capacities are given in Table 2-2.

The distribution system ranges in size from 14-inch mains down to 2-inch mains. The entire distribution system consists of approximately 207 miles of pipe. Pipe size distribution is included in Table 2-3. The City has commenced a pipe replacement program to reduce system leaks.

Table 2-2. City of Lodi's System Storage

Name	Volume, million gallons
Elevated storage tank	0.1
Ground storage tank	1.0
Total	1.1

Table 2-3. City of Lodi's Distribution System

Pipe diameter, inches	Length of pipe, miles
2	13.8
2.5	0.9
3	17.7
4	2.7
6	68.8
8	60.4
10	32.4
12	6.7
14	3.7
Total	207

CHAPTER 3

HISTORICAL AND PROJECTED WATER USE

Water demand projections provide the basis for sizing and staging future water facilities. Water use and production records, combined with projections of population and urban development, provide the basis for estimating future water requirements. This chapter presents a summary of available demographic and water use data and the resulting projections of future water needs for the City of Lodi.

3.1 Population and Housing

Historical population and housing data were obtained from the City of Lodi. An annual population growth rate of 1.5 per year was obtained from the Lodi Wastewater Master Plan (West Yost & Associates, 2001).

It is estimated that the current population in Lodi is approximately 57,935 people. This population is expected to reach 78,030 by 2020 based on the assumed annual growth rate of 1.5 percent. A summary of the historic and projected population and housing in Lodi is presented in Table 3-1 and illustrated in Figure 3-1.

The number of connections to the City's water system per year for the last ten years is shown in Table 3-2. The number of connections by customer classification, as counted by the City of Lodi in the year 1999, are shown in Table 3-3. There has been significant growth in the number of industrial connections over the last five years.

Table 3-1. Population and Housing Projections

Year	Single family households	Multi-family units	Population
1994	13,770	5,962	53,903
1995	14,035	6,015	54,000
1997	14,383	6,300[a]	54,700
1998	14,701	6,400[a]	55,681
1999	14,755	6,500[a]	56,926
2000	14,976	6,600[a]	57,935
2005	16,134	7,100[a]	62,412
2010	17,381	7,700[a]	67,236
2015	18,724	8,300[a]	72,432
2020	20,171	8,900[a]	78,030

Note: Dashed line represents division between historical and projected data.
[a] Multi-family units estimated by assuming 10 dwelling units per multi-family water connection.

Table 3-2. City of Lodi System Connections

Year	Connections
1991	21,769[a]
1994	20,963[a]
1995	21,289[a]
1996	16,172
1997	16,303
1998	16,624
1999	16,753

Source: City of Lodi Public Works Department
[a] Multi-family dwelling units included in value.

Table 3-3. City of Lodi System Connections by Customer Classification, Year 1999

Classification	Connections
Single family	14,755
Multi-family[a]	648
Commercial/institutional	1,271
Industrial	53
Irrigation/landscaping	26
Total	16,753

Source: City of Lodi Public Works Department
[a] Includes mobile home connections.

In summary, from 1994 to 1999, the City of Lodi population increased 5.6 percent, which is a growth rate of approximately 1.1 percent per year. Population is expected to increase by 35 percent, from 57,935 in 2000 to 78,030 in 2020.

3.2 Historical Water Use

Records of historical water production were obtained from the City of Lodi Public Works Department. These data include maximum day and annual water production. Water production is the volume of water measured at the source, which includes all water delivered to residential, commercial, and public authority connections, as well as unaccounted-for water.

3.2.1 Annual Water Production. Groundwater production from 1970 to 1999 is presented in Table 3-4. Total water production in 1999 was 16,587 acre-feet (ac-ft). Historical annual water use for the last 23 years is presented in Table 3-5. Water use by customer class is not available because most of the City's customers are not metered.

Table 3-4. Historical Groundwater Production, acre-feet/year

Year	Production, ac-ft
1970	11,462
1971	12,303
1972	11,686
1973	12,204
1974	12,002
1975	12,294
1976	13,607
1977	10,578
1978	11,477
1979	12,349
1980	12,312
1981	12,487
1982	11,560
1983	11,539
1984	13,997
1985	14,813
1986	15,080
1987	15,304
1988	15,359
1989	14,653
1990	15,387
1991	13,313
1992	13,985
1993	14,013

1994	14,301
1995	14,390
1996	15,102
1997	16,330
1998	14,461
1999	16,587

Source: City of Lodi Public Works Department

3.2.2 Maximum Day Demand. Daily demand fluctuates throughout the year based primarily on seasonal climate changes. Water demands are significantly higher in the summer than the winter. System production facilities must be sized to meet the demand on the maximum day of the year, not just the average. Water systems are sized to meet the greater of either the maximum day demand plus fire flow or peak hour demand. Fire flow and peak hour demand are not addressed in this report.

The average day and maximum day demands for the years 1977 through 1999 are presented in Table 3-5. The maximum day demand in 1999 was 19,667 gpm, in comparison to the total well production capacity of 33,695 gpm. The ratio between average and maximum day demands provides a maximum day peaking factor that can be used to scale annual demand projections to maximum day levels. The average maximum day peaking factor from 1990 to 1999 is 1.94.

Table 3-5. Historical Water Production

	Annual average			Maximum day		
Year	ac-ft/yr	mgd	gpm	mgd	gpm	Peaking factor[b]
1977	10,578	9.44	6,556	19.28	13,389	2.04
1978	11,478	10.25	7,118	--[a]	--	--[a]
1979	12,349	11.02	7,653	22.50	15,625	2.04
1980	12,312	10.99	7,632	24.00	16,667	2.18
1981	12,487	11.15	7,743	22.34	15,514	2.00
1982	11,560	10.32	7,167	21.30	14,792	2.06
1983	11,539	10.30	7,153	21.67	15,049	2.10
1984	13,997	12.50	8,681	26.20	18,194	2.10
1985	14,814	13.22	9,181	--[a]	--	--[a]
1986	15,081	13.46	9,347	26.91	18,688	2.00
1987	15,305	13.66	9,486	27.00	18,750	1.98
1988	15,360	13.71	9,521	28.40	19,722	2.07
1989	14,654	13.08	9,083	28.50	19,792	2.18
1990	15,387	13.74	9,542	24.29	16,868	1.77
1991	13,313	11.88	8,250	21.55	14,965	1.81
1992	13,985	12.48	8,667	24.00	16,667	1.92
1993	14,013	12.51	8,688	24.10	16,736	1.93
1994	14,301	12.77	8,868	22.94	15,931	1.80
1995	14,390	12.85	8,924	24.64	17,111	1.92
1996	15,102	13.48	9,361	27.93	19,396	2.07
1997	16,330	14.58	10,125	28.68	19,917	1.97
1998	14,461	12.91	8,965	29.66	20,597	2.30
1999	16,587	14.81	10,285	28.32	19,667	1.91
2000	--[a]	--[a]	--	--[a]	--	--[a]
Average 1977 – 1999		--	--	--	--	2.01
Average 1990 – 1999		--	--	--	--	1.94

Source: City of Lodi Public Works Department

[a] Data unavailable.

[b] Maximum day peaking factor = maximum day demand/annual average day demand.

3.2.3 Unaccounted-for Water. Unaccounted-for water use is unmetered water use such as from fire protection and training, system and hydrant flushing, sewer cleaning, construction, system leaks, and unauthorized connections. Unaccounted-for water can also result from meter inaccuracies. Since the City of Lodi's system is not completely metered, data are unavailable for determining the percent of unaccounted-for water. Unaccounted-for water is generally assumed to be approximately 10 percent of total water production.

3.3 Unit Water Use

Historical unit water use expressed as gallons per connection per day (gpd/connection) and as gallons per capita per day (gpd/capita) are shown in Table 3-6. These unit demands include unaccounted-for water.

Table 3-6. Connection and Population Unit Water Use

Year	Connection unit water use demands, gpd/connection[a]	Population unit water use demands, gpd/capita[b]
1996	834	248
1997	894	267
1998	777	232
1999	884	260

[a] Gallons per connection per day.
[b] Gallons per capita per day.

3.4 Projected Water Demands

Future water demands are estimated in this report based on a constant 1.5 percent annual water demand growth rate. Demands were projected based on actual water use in 1999. These projections are shown in Table 3-7 and illustrated on Figure 3-2. By 2020, average annual water demands are expected to increase by 36 percent, from 14.8 mgd (16,587 ac-ft/yr) in 1999 to 20.3 mgd (22,727 ac-ft/yr) in 2020. Reductions in water use due to conservation measures taken in the future are not reflected in the projected water demands.

Table 3-7. Total Projected Water Demands

	Annual average		Maximum day
Year	ac-ft/yr	mgd	mgd
2000	16,874	15.1	29.2
2005	18,178	16.2	31.5
2010	19,583	17.5	33.9
2015	21,096	18.8	36.5
2020	22,727	20.3	39.4

CHAPTER 4

WATER SUPPLY QUANTITY

The City of Lodi currently uses groundwater as its sole source of supply. This chapter describes the groundwater basin, current and projected water supplies, water supply reliability, and water shortage expectations.

4.1 Groundwater

This section describes the groundwater supply and its physical and legal constraints. No surface water is currently used in the City of Lodi water system. However, as a result of a 1930's lawsuit, the City does have a limited entitlement to 3,600 acre-feet of surface water (21 percent of the City's 2000 demand) from the Mokelumne River/East Bay Municipal Utility District. The availability of this water to the City is under question due to the number of conditions specified under this "Lodi Decree".

4.1.1. Description. The groundwater basin underlying the City of Lodi is part of the longer San Joaquin Valley groundwater basin. The groundwater basin in the Lodi area occurs under unconfined and semi-confined conditions. The Mehrten Formation is the most productive fresh water-bearing unit.

The City of Lodi is located within the geomorphic province known as the Central Valley, which is divided into the Sacramento Valley and the San Joaquin Valley. The Central Valley is a large, northwestward-trending, asymmetric structural trough that has been filled with several miles of thick sediment (USGS 1986). The City of Lodi lies within the San Joaquin Hydrologic Basin (DWR, Bulletin 118) which straddles portions of both the Sacramento and San Joaquin Valleys. Sediments of the San Joaquin Valley consist of interlayered gravel, sand, silt, and clay derived from the adjacent mountains and deposited in alluvial-fax, floodplain, flood-basin, lacustrine, and marsh environments. Hydrogeologic units in the San Joaquin Basin include both consolidated rocks and unconsolidated deposits. The consolidated rocks include 1) the Victor Formation, 2) Laguna Formation, and 3) the Mehrten Formation. The consolidated rocks generally yield small quantities of water to wells except for the Mehrten Formation which is an important aquifer (DWR, internet site). The unconsolidated deposits include 1) continental deposits, 2) lacustrine and marsh deposits, 3) older alluvium, 4) younger alluvium, and 5) flood-basin deposits. The continental deposits and older alluvium are the main water-yielding units in the unconsolidated deposits.

Groundwater levels in the City of Lodi area are generally decreasing. The groundwater levels also fluctuate over time depending on precipitation, aquifer recharge, and pumping demands. This decrease in groundwater levels is an indicator of an overdrafted groundwater basin. Groundwater elevations relative to mean sea level (MSL), annual precipitation, and water production from 1927 through 2000 are shown in Figure 4-1. Overall, the average annual decrease in groundwater levels from 1927 to 2000 has been 0.35 feet per year. Generally, groundwater elevations have decreased with the increase in population and water production. However, annual rainfall also influences groundwater elevation. The groundwater level increase from 1981 to 1984 can be partially attributed to the increase per year in annual rainfall from 1981 to 1983. Groundwater elevations for the years 1927 to 1961 were obtained from East Bay Municipal Utility District (EBMUD) for the City's six square mile area. Groundwater elevation data from 1962 to the present were obtained from the City's Public Works Department for Well No. 2, one of the oldest production wells in Lodi.

4.1.2 Physical Constraints. The City of Lodi's system currently has twenty-four active wells with a total pumping capacity of 48.5 mgd. The physical constraints on the groundwater supply are the pumping capacity of the existing wells. However, the fact that the groundwater basin is overdrafted

means that in the long term the groundwater supply is something less than the current annual pumping rate.

The declining groundwater basin is a result of the groundwater extraction by all groundwater pumpers in the area. This includes groundwater pumping by other cities, agriculture, private well owners, as well as the pumping by the City of Lodi. The City will likely have to reduce its groundwater pumping in the long-term as part of what will have to be a regional effort to stabilize the groundwater basin. This could be accomplished by three possible approaches:

1. The City reduces its demand and groundwater pumping to a yet to be defined sustainable rate.
2. The City utilizes surface water as an additional supply to offset reductions in groundwater pumping. A conjunctive use project could be implemented that utilizes surface water as a supply in wet years, thereby allowing for a net reduction in groundwater pumping.
3. The City helps provide surface water to others, such as agricultural customers, to reduce groundwater pumping in the area by others.

4.1.3 Legal Constraints. There are no legal constraints on groundwater pumping. In California, the State is not authorized by the Water Code to manage groundwater. California landowners have a correlative right to extract groundwater for beneficial use. As a municipal water supplier, the City's appropriate rights are junior to overlying landowners.

4.2 Groundwater Quality

The United States Environmental Protection Agency (EPA) is currently considering or has implemented several new or revised drinking water standards. The Radon, Arsenic, and the Groundwater Rule may impact the City of Lodi.

Radon is not currently regulated, although EPA recently proposed a maximum contaminant level (MCL) of 300 picoCuries/liter (pCi/L). Water systems in states that develop multimedia mitigation (MMM) plans to address indoor air radon levels, or in absence of a state MMM program, that initiate enhanced indoor air radon level reduction programs, would be able to comply with an alternate MCL of 4,000 pCi/L. Treatment for compliance with the proposed radon standard may need to be provided to all subject groundwater sources within the specified time frame following promulgation of the final rule. The average radon concentration in Lodi's 24 wells from 1997 to 1999 was 450 pCi/L.

As required by the 1996 amendments to the Safe Drinking Water Act (SDWA), the arsenic standard in drinking water has been recently changed to a MCL of 10 µg/L from the previous 50 µg/L standard. None of the 24 Lodi wells sampled from 1997 to 2000 contained arsenic concentrations higher than the new standard of 10 µg/L. Therefore, the new arsenic standard is not an issue for the City.

Dibromochloropropane (DBCP) was a chemical previously used by farmers in the Lodi area to control nematodes in vineyards and other crops. DBCP was banned in California in 1977, but is still present in trace levels in some groundwater supplies. The MCL for DBCP has been set at 0.2 micrograms per liter (µg/L). The year 2000 average concentration of DBCP in water delivered from Lodi's 24 wells was 0.04 µg/L. Approximately a fourth of Lodi's wells have granular activated carbon (GAC) filters to remove DBCP, while the remaining wells have no detectable or trace amounts of DBCP (City of Lodi Public Works Department, 2000).

The U.S. EPA is proposing the Ground Water Rule (GWR), which contains measures to establish multiple barriers to further protect against bacteria and viruses in drinking water from ground water sources. The proposed GWR will specify when corrective action (including disinfection) is required to further protect groundwater system consumers from bacteria and viruses. The GWR is scheduled to be issued as a final regulation in summer 2001. The City of Lodi may be required to disinfect (i.e. chlorinate) its groundwater sources as a result of this proposed rule.

4.3 Current and Projected Water Supplies

The projected annual sustainable water supply and demand for the Lodi system is compared and summarized in Table 4-1. Recycled water supply is addressed in Chapter 6. As described earlier, the groundwater basin is in an overdraft condition. Therefore, the sustainable groundwater extraction rate for the City is likely something less than current annual pumping rates. For the purposes of this study, the sustainable groundwater supply is assumed to be approximately equivalent to the 1980 pumping rate, or approximately 12,000 ac-ft/yr. This assumption regarding sustainable groundwater supply is only an approximation since the safe yield of the groundwater basin underlying the City has not been defined. As a comparison, the 1990 through 1999 groundwater use averaged 14,787 ac-ft/yr. As shown in Table 4-1, the water supply is not adequate to meet projected demands.

Table 4-1. Water Supply and Demand Comparison, ac-ft/yr

	2000	2005	2010	2015	2020
Sustainable Water supply					
Surface water	0	0	0	0	0
Groundwater[a]	12,000	12,000	12,000	12,000	12,000
Recycled water[b]	0	0	0	0	0
Total	12,000	12,000	12,000	12,000	12,000
Demand	16,874	18,178	*19,583*	*21,096*	*22,727*
Surplus or (Deficit)	-4,874	-6,178	-7,583	-9,096	-10,727

Units of Measure: ac-ft/yr

[a] Based on 1980 pumping rate.

[b] Based on current conditions. Recycling may occur in the service area within 20 years.

4.4 Water Supply Reliability

The annual quantity of groundwater available does not significantly vary up or down in relation to wet or dry years. The estimated year 2020 water supply available in average, dry, and multiple dry years is presented in Table 4-2. As shown in Table 4-2, the sustainable water supply is not adequate to meet projected demands during multiple dry years.

Table 4-2. Water Supply Reliability, 2020, ac-ft/yr

	Average/normal water year	Single dry water year	Multiple dry water years		
			Year 1	Year 2	Year 3
Sustainable Water supply					
Surface water	0	0	0	0	0
Groundwater[a]	12,000	12,000	12,000	12,000	12,000
Recycled water[b]	0	0	0	0	0
Total	12,000	12,000	12,000	12,000	12,000
2020 Demand	22,727	22,727	22,727	22,727	22,727
Surplus or (Deficit)	-10,727	-10,727	-10,727	-10,727	-10,727

Units of measure : ac-ft/yr

[a] Based on 1980 pumping rate.

[b] Based on current conditions. Recycled water may be available by 2020.

4.5 Water Shortage Expectations

Short-term groundwater supply shortages are not expected. The City currently has six wells fitted with emergency diesel-powered generators during power outages, which increases the reliability of supply. As described earlier, the groundwater basin is in an overdraft condition that will require the City to eventually take steps to reduce overall groundwater pumping. Continuing decline of groundwater levels could result in the need to drill deeper wells.

The City of Lodi is actively participating in acquiring future water supplies in the northeastern San Joaquin County area. The City is part of the Northeastern San Joaquin County Groundwater Banking Authority whose purpose and goals include negotiating a conjunctive use project with the East Bay Municipal Utility District (EBMUD). The latest conjunctive use water planning and principles and negotiations with EBMUD are included in Appendix D.

The City of Lodi's Water Shortage Contingency Plan is included in Appendix F.

CHAPTER 5
WATER CONSERVATION BEST MANAGEMENT PRACTICES

Water conservation is a method available to reduce water demands, thereby reducing water supply needs for the City of Lodi (City). This chapter presents an analysis of water conservation best management practices (BMPs) and a description of the methods and assumptions used to conduct the analysis.

The unpredictable water supply and ever increasing demand on California's complex water resources have resulted in a coordinated effort by the DWR, water utilities, environmental organizations, and other interested groups to develop a list of urban BMPs for conserving water. This consensus-building effort resulted in a Memorandum of Understanding Regarding Urban Water Conservation in California (MOU), as amended September 16, 1999, among parties, which formalizes an agreement to implement these BMPs and makes a cooperative effort to reduce the consumption of California's water resources. The BMPs as defined by the MOU are presented in Table 5-1. The MOU is administered by the California Urban Water Conservation Council (CUWCC). The City of Lodi is not a signatory of the MOU.

The value to the City of signing the MOU, which is a voluntary agreement, cannot be quantified. If the City desires to demonstrate that water use efficiency is being addressed to industry standards of practice, then signing the MOU should be considered. Being a signatory of the MOU may be a future requirement to receive water project grant and loan funding from the State.

The MOU requires that a water utility implement only the BMPs that are economically feasible. If a BMP is not economically feasible, the water utility may request an economic exemption for that BMP. The BMPs as defined in the MOU are generally recognized as standard definitions of water conservation measures.

TABLE 5-1. WATER CONSERVATION BEST MANAGEMENT PRACTICES

No.	BMP Name
1.	Water survey programs for single-family residential and multi-family residential connections.
2.	Residential plumbing retrofit.
3.	System water audits, leak detection and repair.
4.	Metering with commodity rates for all new connections and retrofit of existing connections.
5.	Large landscape conservation programs and incentives.
6.	High-efficiency washing machine rebate programs.
7.	Public information programs.
8.	School education programs.
9.	Conservation programs for commercial, industrial, and institutional accounts.
10.	Wholesale agency assistance programs.
11.	Conservation pricing.
12.	Conservation coordinator.
13.	Water waste prohibition.
14.	Residential ULFT replacement programs.

5.1 Current Water Conservation Program

Water conservation in Lodi is supported by the City Council and Lodi's citizens. The current program consists mainly of outdoor watering restrictions enforced by water conservation patrol staff, public education, and an in-school education program.

The City has had an enforced ordinance for water conservation continuously since 1977 and it has developed into one of the most comprehensive on-going programs functioning in the San Joaquin Valley. A copy of the conservation ordinance information sheet is included in Appendix C in English

and Spanish. The program consists mainly of outdoor watering restrictions enforced by water conservation patrol officers, public education, and an in-school education program. From 1977 through 1988, a single water conservation officer patrolled during the months of May through October. Since 1989, three to four water conservation officers have patrolled from May through October to intensify and enhance the program.

The Water Conservation Patrol staff's duties are to enforce the provisions outlined in the City Ordinance. These include prohibition of water waste, provision for dissemination of information and advice to aid water customers, and notices of violation issuance for water wasting. The ordinance information sheet is given out when water wasting is observed. All violations are recorded on a violation card (Appendix C) and filed by address. The success of Lodi's water conservation program was evaluated in an in-house study. The summary report of the study is given in Appendix C.

A Water Educational Program was introduced to Lodi elementary schools in 1986. This program supplements and enhances the City of Lodi's total effort to conserve water, as well as other natural resources. In 1986, four pilot schools were introduced to the program. Presentations have been given in 10 schools, including four parochial schools, within the Lodi City limits. In 1998, there were 252 classroom presentations. The program includes water science demonstrations with the objective of instilling water awareness and providing information about Lodi's water system and water conservation techniques.

The education program is aimed at grades K through 6th. It is felt to be most cost effective to develop water awareness and a sense for water conservation while children are most impressionable during their formative years. A more detailed discussion of the educational program is contained in Appendix C.

The City water conservation program participates in local fairs, including the Crime Prevention Fair (sponsored by Lodi Police Dept.), the Conservation Fair (sponsored by local agencies concerned with conservation), and the Lodi Grape Festival and Harvest Fair, and other special events. Staff converses with the fairs' visitors about Lodi's water conservation program and answers questions they might have concerning water issues. The City of Lodi also hands out information sheets and conservation kits and holds contests for prizes such as low flow shower heads.

Watering day reminders have been periodically included on the utility bills and on Lodi's cable TV station throughout the summer months. Newspaper articles and ads are also published throughout the year in Lodi's and Stockton's newspapers reminding Lodi residents of the water conservation regulations, offering conservation tips, and relaying the successes of the program. Attractive refrigerator magnets with the watering day and hour schedules are given out by patrol officers and at the local fairs.

5.2 Economic Analysis Methodology and Assumptions

An economic analysis was conducted for 6 of the 14 BMPs (Table 5-1) that are described in the MOU and that the City of Lodi is not currently implementing (i.e., BMP nos. 1, 4, 5, 6, 9 and 14). BMP 4 is analyzed for two cases. Case 1 consists of installing meters and meter boxes at all pre-1992 connections. Case 2 consists of installing meters only at all post 1992 connections. The intent of the analysis is to determine if the BMPs not being implemented are not economically feasible. The remaining BMP 2 is not analyzed because the City is already currently implementing it. Economic analyses were not done for BMPs 3, 7, 8, 10, 11, 12, and 13 because they are essentially non-quantifiable, but essential to the success of those BMPs that are quantifiable. These BMPs are considered non-quantifiable because the water savings cannot be accurately estimated. These non-quantifiable BMPs have already been implemented by the City.

Assumptions used in the economic analysis for each BMP are described in Table E-1 (Appendix E). Directly beneath each assumption is a brief description of the rationale and/or supporting evidence for that assumption. Common assumptions for all BMPs are the value of conserved water ($500/ac-ft), and the real discount rate (6.15%). The real discount rate was calculated from the assumed real cost of money (8.82%) and the assumed long-term inflation rate (2.52%) using the precise conversion method (A&N Technical Services, 2000. pg A-2). The value of conserved water includes estimated costs of new well construction and the costs of importing surface water to reduce the groundwater overdraft. Also included are non-water utility benefits, such as reduced wastewater conveyance and treatment costs. A breakdown of the number of metered and unmetered connections for each customer category in 1999 is presented in Table 5-2. State law requires that meters will be installed on new residential connections.

Table 5-2. City of Lodi Connections by Classification, Year 1999

	Connections	
Classification	Metered	Unmetered
Single family	0	14,755
Multi-family	0	648
Commercial/institutional	956	315
Industrial	53	0
Irrigation/landscaping	17	9
Other	0	0
Total	1,026	15,727

Source: City of Lodi

The economic analysis was performed using Microsoft® Excel 97, a spreadsheet program. A separate, customized worksheet for each BMP is presented in Appendix E. Each BMP economic analysis spreadsheet projects, on an annual basis, the number of interventions and the dollar values of the benefits and costs that would result from implementing a particular BMP. Terms and formulas that are common to all the worksheets are defined in Table 5-3.

5.3 Economic Analysis Results

The results of the economic analysis in terms of the benefit/cost (B/C) ratio, the simple pay-back period, the discounted cost per ac-ft of water saved, and the net present value (NPV) per ac-ft of water saved for each BMP are presented in Table 5-4. As illustrated in Table 5-4, BMPs 4, 5, 9, and 14 are cost effective. BMP 4 Case 1, installing meters and meter boxes, has a B/C ratio of 1.0. This indicates that the City's economic benefits would equal the costs of this BMP.

Annual water savings and costs for each of the BMPs with a B/C ratio equal to or greater than one are presented graphically on Figures 5-1 and 5-2 and summarized in Table 5-5. The number of annual interventions required for each BMP and the annual expenditure necessary if the City of Lodi is to be in compliance with the MOU for all cost effective, quantifiable BMPs is presented in Table 5-5. Interventions are actions or activities required to implement each BMP.

The water savings and costs associated with BMPs 3, 7, 8, 10, 11, 12, and 13 are not included in Figures 5-1 and 5-2 and Table 5-5, since no specific level of effort is defined in the MOU for these BMPs.

5.4 Additional Issues

This section describes additional issues required to be addressed by the Urban Water Management Planning Act. Non-economic factors, including environmental, social, health, technological and customer impacts are not thought to be significant in deciding which BMPs to implement. No water supply projects are currently planned that would supply water at a higher unit cost.
The City of Lodi has the legal authority to implement the BMPs.

Table 5-3. Definition of Terms Used in the Economic Analysis

Term	Definition	Comments
BENEFITS:		
Avoided Capital Costs	Capital costs that are avoided by implementing the BMP.	An example is the cost of a well that would not have to be installed due to implementation of the BMP.
Avoided Variable Costs	Variable costs that are avoided by implementing the BMP.	An example is the cost of electricity that would be saved if the BMP were implemented.
Avoided Purchase Costs	Purchase costs that are avoided by implementing the BMP.	An example is the cost of purchasing water that would not be needed due to implementation of the BMP.
Total Undiscounted Benefits	The sum of avoided capital costs, avoided variable costs and avoided purchase costs.	
Total Discounted Benefits	The present value of the sum of avoided capital costs, avoided variable costs and avoided purchase costs.	An annual percentage rate consisting of the cost of borrowing money minus the inflation rate.
COSTS:		
Capital Costs	Capital costs incurred by implementing the BMP.	For example, the cost to purchase and install meters for BMP 4.
Financial Incentives	The cost of financial incentives paid to connections.	Copay or distribution for purchasing low-flow plumbing devices or washing machines are examples of financial incentives.
Operating Expenses	Operational expenses incurred during implementation of the BMP.	
Total Undiscounted Costs	The sum of capital costs, financial incentives, and operating expenses.	
Total Discounted Costs	The present value of the sum of capital costs, financial incentives, and operating expenses.	The discount rate is used to calculate discounted costs from undiscounted costs.
NET PRESENT VALUE	Total discounted benefits minus total discounted costs.	A value greater than zero indicates an economically justifiable BMP.
RESULTS:		
Benefit/Cost Ratio	The sum of the total discounted benefits divided by the sum of the total discounted costs.	A ratio greater than one indicates an economically justifiable BMP.
Simple Pay-Back Period	The number of years required for the benefits to pay back the costs of the BMP, calculated as the sum of the total discounted costs divided by the average annual total discounted benefits.	A low value is considered economically attractive.
Discounted Cost/Water Saved	The present-value cost to save one acre-foot of water, calculated as the sum of the total discounted costs divided by the total acre-feet of water saved over the study period.	A low value is considered economically attractive because it indicates a low implementation cost. Value must be less than the marginal cost of new water to be cost effective.
Net Present Value/Water Saved	The net value of saving one acre-foot of water, calculated as the sum of the net present value divided by the total acre-feet of water saved over the study period.	A high value is considered economically attractive.

Table 5-4. Results of Economic Analysis

BMP No.	BMP Name	Total discounted cost over study period ($)	Total water saved[a] (ac-ft)	Benefit/ cost ratio	Simple payback period (years)	Discounted cost/water saved ($/ac-ft)	Net present value/ water saved ($/ac-ft)
1	Water survey programs for single-family residential and multi-family residential connections.	112,691	307	0.8	15	368	-56
4 - Case 1 *(meters and meter boxes)*	Metering with commodity rates for all new connections and retrofit of existing connections	7,430,344	30,600	1.0	23	243	-6
4 - Case 2 *(meters only)*	Metering with commodity rates for all new connections and retrofit of existing connections	239,225	2,708	3.1	7	88	187
5	Large landscape conservation programs and incentives.	25,414	449	5.6	2	57	262
6	High-efficiency washing machine rebate programs.	133,978	410	0.7	28	327	-90
9	Conservation programs for commercial, industrial, and institutional (CII) accounts.	279,169	1,541	1.4	9	181	79
14	Residential ULFT replacement programs.	329,468	1,591	1.2	16	207	48

[a] Total water saved over study period. Study period is different for each BMP. Refer to Appendix E.

Note: This analysis includes non-water utility benefits, such as reduced wastewater conveyance and treatment costs.

Table 5-5. City of Lodi - Summary of BMP Annual Interventions, Water Saved and Cost

	BMP 1: Residential water surveys			BMP 4: Install meters *Case 1 – Install meters and meter boxes*			BMP 4: Install meters *Case 2 – Install meters only*			BMP 5: Large landscapes		
Year	Interventions[a]	Water saved (ac-ft/yr)	Cost ($/yr)	Interventions[a]	Water saved (ac-ft/yr)	Cost ($/yr)	Interventions[a]	Water saved (ac-ft/yr)	Cost ($/yr)	Interventions[a]	Water saved (ac-ft/yr)	Cost ($/yr)
2002	B/C<1	B/C<1	B/C<1	0	0	0	0	0	0	0	0	0
2003				740	124	472,311	461	77	54,339	16	13	4,166
2004				740	249	485,637	461	155	62,628	16	26	4,166
2005				1,036	423	687,887	0	155	16,578	20	40	4,663
2006				1,036	597	706,542	0	155	16,578	20	54	4,663
2007				1,333	821	914,122	0	155	16,578	18	48	2,234
2008				1,333	1,045	938,108	0	155	16,578	18	42	2,234
2009				1,629	1,319	1,151,018	0	155	16,578	22	36	2,731
2010				1,629	1,592	1,180,334	0	155	16,578	22	31	2,731
2011				2,665	2,040	1,870,886	0	155	16,578	36	37	4,469
2012				2,665	2,488	1,918,858	0	155	16,578	36	44	4,469
2013				0	2,488	266,508	0	155	16,578	0	36	0
2014				0	2,488	266,508	0	155	16,578	0	27	0
2015				0	2,488	266,508	0	155	16,578	0	14	0
2016				0	2,488	266,508	0	155	16,578	0	0	0
2017				0	2,488	266,508	0	155	16,578	0	0	0
2018				0	2,488	266,508	0	155	16,578	0	0	0
2019				0	2,488	266,508	0	155	16,578	0	0	0
2020				0	2,488	266,508	0	155	16,578	0	0	0
Total				14,806	30,600	12,457,768	921	2,708	382,215	222	449	36,525

Note: B/C<1 indicates a benefit to cost ratio less than one, which is not cost effective. Annual BMP activities based on MOU guidelines.

[a] Interventions is the quantity or number of each item.

Table 5-5. City of Lodi - Summary of BMP Annual Interventions, Water Saved and Cost (Continued)

	BMP 6: Washing machine rebates			BMP 9: CII conservation			BMP 14: Residential ULFT			Total		
Year	Interventions[a]	Water saved (ac-ft/yr)	Cost ($/yr)	Interventions[a]	Water saved (ac-ft/yr)	Cost ($/yr)	Interventions[a]	Water saved (ac-ft/yr)	Cost ($/yr)	Interventions[a]	Water saved (ac-ft/yr)	Cost ($/yr)
2002	B/C<1	B/C<1	B/C<1	0	0	0	50	2	6,300	50	2	6,300
2003				16	14	11,652	600	20	75,600	1,833	249	618,069
2004				16	29	11,652	400	32	50,400	1,633	489	614,483
2005				285	48	43,135	500	47	63,000	1,841	713	815,263
2006				285	68	43,135	500	62	63,000	1,841	937	833,918
2007				288	76	45,077	500	78	63,000	2,138	1,178	1,041,012
2008				288	85	45,077	200	84	25,200	1,838	1,411	1,027,198
2009				297	105	51,874	200	90	25,200	2,148	1,704	1,247,402
2010				297	124	51,874	200	96	25,200	2,148	1,998	1,276,717
2011				273	121	34,396	200	102	25,200	3,174	2,455	1,951,529
2012				273	117	34,396	200	109	25,200	3,174	2,912	1,999,500
2013				273	105	34,396	0	109	0	273	2,892	317,482
2014				273	93	34,396	0	109	0	273	2,871	317,482
2015				0	93	0	0	109	0	0	2,858	283,086
2016				0	93	0	0	109	0	0	2,844	283,086
2017				0	93	0	0	109	0	0	2,844	283,086
2018				0	93	0	0	109	0	0	2,844	283,086
2019				0	93	0	0	109	0	0	2,844	283,086
2020				0	93	0	0	109	0	0	2,844	283,086
Total				2,865	1,541	441,064	3,550	1,591	447,300	22,364	36,889	13,764,872

Note: B/C<1 indicates a benefit to cost ratio less than one, which is not cost effective. Annual BMP activities based on MOU guidelines.
[a] Interventions is the quantity or number of each item.

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Summary of qualifications

City of Lodi, Public Works Department 1975-present
Lodi, California

Public Works Director since 1998 (and subordinate positions) – municipal engineering infrastructure and planning for city of 58,000, including planning, designing and constructing street, traffic, water, wastewater, drainage and park improvements. Management of solid waste and transit contracts. Management of Public Works Department and participation in management of City.

Work experience

City of Lodi, Public Works Department 1988-1998

City Engineer, Assistant City Engineer – Division manager of twelve-person engineering staff covering design, development services, traffic engineering and construction inspection. Responsible for majority of City's capital improvement program. Author of City's Public Improvement Design Standards. Member of City Management Team since mid-1995.

Member of San Joaquin Council of Governments Technical Advisory Committee, mainly covering county transportation and land-use issues. Committee chair 1995-96.

City of Lodi, Public Works Department 1978-1988

Associate Civil Engineer – Section manager of eight-person engineering staff covering design and traffic engineering. Responsible for large portion of City's capital improvement program. Oversaw and performed preliminary study and design work on numerous street, traffic signal, water well, drainage basin and underground utility projects. Chairman of Utility Coordinating Committee which included three private utilities plus all City utilities. Chairman of Public Works Safety Committee, 1980.

City of Lodi, Public Works Department 1975-1978

Assistant/Junior Civil Engineer – Performed preliminary study and design work on street, traffic signal, water well, drainage basin and underground utility projects

Served as acting Water Superintendent for nine months while Department reorganization was being evaluated. Responsible for operation and maintenance of City water wells and mains.

Pacific Gas & Electric Co., Design/Drafting Department 1974-1975

Junior Engineering Designer – Designed electrical substation grading and foundation plans and electrical equipment structures.

Education

University of California at Berkeley 1968-1974
Bachelor of Science Degree in Civil Engineering with Honors.
Editor (2 years) California Engineer – student engineering magazine
Cooperative Work-Study Program – two six-month work sessions at the City of Alameda Engineering Division and one session at the City of Hayward Engineering Division.

Accreditations

Registered Civil Engineer, State of California (#C28183)

Professional memberships

American Public Works Association
American Society of Civil Engineers
Institute of Transportation Engineers
American Waterworks Association
Water Environment Federation

Awards received

1995 Engineer of the Year from San Joaquin Engineer's Council
1995 Cognize Award from San Joaquin Council of Governments
1974 UC Berkeley College of Engineering Wiskocil Professional Leadership Award

Community activities

Lodi Lion's Club
1992 Graduate, Lodi District Chamber of Commerce Leadership Lodi Program
Parent Committee Treasurer and "active dad" with Boy Scout Troop 199
California Army National Guard, 1970-1976, Combat Engineer, Water Purification Specialist, Honorable Discharge at rank of Staff Sergeant